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ABSTRACT

This annotated bibliography includes selected books, articles, and reports on the use of technology (primarily computers and interactive video) with students displaying moderate cognitive abilities. The bibliography lists items issued between 1979 and 1990. It describes four items on vocational skills/transition; six items on academic instruction; five items on language/communication; six items on access and general use characteristics; and five items on daily living skills/self-help. (JDD)

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Center for Special Education Technology

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# Selected Readings: **Technology for Students with Moderate Cognitive Abilities**

This annotated bibliography includes selected books, articles, and reports on the use of technology with students displaying moderate cognitive abilities. The entries were selected to meet the information needs of special educators and other service providers.

## Vocational Skills/Transition

**Culclasure, D. F. (1982, June). *A pilot project to evaluate the use of low-cost microcomputers to improve the effectiveness of ABE services provided mentally handicapped adults*: *Final report*. San Antonio State Hospital, Texas Office of Education Services. (ERIC Document Reproduction Service No. ED 228 542)**

This study evaluates the potential of low-cost microcomputers for enhancing the effectiveness of adult basic education (ABE) programs conducted for mentally disabled adults. During the study, two learning conditions were assessed—massed versus spaced learning. Analysis of the results reveal that computer-assisted instruction was superior as an instructional methodology to both programed instruction and traditional classroom teaching approaches. The results also suggest that spaced practice was superior to massed practice in terms of facilitating learning.

**Dummeyer, M. B., & Mikesell, S. L. (1990, October/November). Use of technology in a sheltered workshop setting. *Closing the Gap*, 18-21.**

This article addresses the communication limitations of developmentally disabled adults through the use of the Apple IIe computer and peripherals. The peripherals include the Echo speech synthesizer, Adaptive Firmware Card, Unicorn Expanded Keyboard and a variety of switches. The authors report benefits to clients including increased participation, improved motivation, and interest. An annotated listing of appropriate public domain and commercial software is included.

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**Gaylord-Ross, R., & Others. (1987). Community-referenced instruction in technological work settings. *Exceptional Children, 54*(2), 112-120.**

Two studies investigate the extent to which high-school students with disabilities such as moderate mental retardation, learning disabilities, and deafness learn work behaviors in a technological setting. Findings of the two studies indicate that community training led to learning of technological work tasks and a number of generic work skills. In addition, the students were perceived by others as being significantly more vocationally competent after the training.

**Hallworth, H. J., & Brebner, A. (1980, April). *CAI for the developmentally handicapped: Nine years of progress*. Paper presented at the Association for the Development of Computer-Based Instructional Systems, Washington, DC. (ERIC Document Reproduction Service No. ED 198 792)**

Initiated 9 years ago by the University of Calgary in cooperation with the nearby Vocational and Rehabilitation Research Institute (VRRI), this project uses computer-assisted instruction (CAI) to teach social and vocational skills to developmentally disabled young adults, many of whom also have physical impairments. The teaching of social, arithmetic, and reading skills necessitated the use of multimedia terminals, and several such terminals have been developed and used. The current model, based upon a microprocessor, can be adapted to the needs of the individual learner. Principles derived from research on learning among students with moderate cognitive abilities have been used to design two programs to teach social skills needed for independent living in the community. Special input devices enable the physically disabled to communicate with the computer, and "concept keyboards" assist those with moderate cognitive abilities by reducing the amount of mental recoding required. The success of this project, now an integral part of the VRRI program, is leading to further use of CAI at the institute and in other centers.

## Academic Instruction

**Baumgart, D., & Van Walleghem, J. (1987). Teaching sight words: A comparison between computer-assisted and teacher-taught methods. *Education and Training in Mental Retardation, 22*(1), 56-65.**

The study compares computer-assisted instruction with a speech synthesizer to teacher instruction in teaching grocery sight words to three adults with moderate cognitive abilities in an alternating treatments design. Two of the subjects learned equally well with either method while one learned only in the teacher-taught situation.

**Berger, R. (1989). *Teaching mild to moderately retarded students with computers*. New York, NY: Long Island University. (ERIC Document Reproduction Service No. ED 322 650)**

The paper reviews the literature on use of computers with cognitively impaired students. The chapter on historical context reviews research on the efficacy of teaching machines with this population. Research on the effectiveness of computer-assisted instruction and computer-assisted learning as an adjunct to teacher instruction is reviewed in the second chapter. The third chapter looks at new applications of computer technology in the areas of simulation, artificial intelligence, and robotics.

**Brewer, N., & Others. (1990). A computerized procedure for teaching letter formation skills to mentally retarded individuals. *Journal of Educational Technology Systems, 18*(3), 185-190.**

This article describes a microcomputer-based procedure that uses a digitized graphics tablet to teach letter formation skills to students ages 8-19 with moderate to severe disabilities. Handwriting instruction is discussed; modeling of the letters, corrective feedback, and reinforcement techniques are explained; and results of pretests and posttests are considered.

**Conners, F. A., & Detterman, D. K. (1987). Information-processing correlates of computer-assisted word learning by mentally retarded students. *American Journal of Mental Deficiency, 91*(6), 606-12.**

Nineteen students (ages 9-22) with moderate to severe disabilities completed ten 15-minute computer-assisted instruction sessions and seven basic cognitive tasks. Simple learning, choice reaction time, relearning, probed recall, stimulus discrimination, tachistoscopic threshold, and recognition memory were measured. The authors found that stimulus discrimination, probed recall, and simple learning were significantly related to word learning.

**Hasselbring, T. S., & Goin, L. I. (1988). Use of computers. In G. A. Robinson, J. R. Patton, E. A. Polloway, & L. R. Sargent (Eds.), *Best Practices in Mental Disabilities—Volume Two*. Reston, VA: Council for Exceptional Children. (ERIC Document Reproduction Service No. ED 304 838)**

This research-based review discusses effective computer applications for students with mental disabilities. Studies on math fluency indicate that when students are using counting strategies to solve basic math facts, computer-based drill-and-practice activities do not lead to fluent recall of math facts. However, tutorial plus drill activities can lead to fluency. In the area of reading, the scope of existing research is too narrow to draw conclusions about the utility of computer-based practice in remediating overall reading deficiencies. It has been found that microcomputers are well-suited for providing extended practice that can lead to increased fluency in decoding skills. Research on spelling shows that improved skills can result if the computer-based program requires students to use long-term memory, limits the size of the practice set to 20 spelling words, spaces practice over 3 weeks, and emphasizes speed and accuracy. Use of computers in teaching writing should include instruction in keyboarding, word processing and idea processing software, and task-specific strategies. It also examines the use of computers to teach thinking and problem-solving skills through use of LOGO and simulations.

**Panyan, M., Hummel, J., & Jackson, L. (1988). The integration of technology in the curriculum. *Journal of Special Education Technology, 9*(2), 109-119.**

The article describes a 3-year research project to develop an applications model to successfully integrate technology in the instruction of mild and moderately disabled elementary-grade students. The model focuses on decisions of school personnel in such areas as identification of content, instructional methods, organization of instruction, and outcome assessment.

## Language/Communication

**Meyers, L. F. (1984). Use of microprocessors to initiate language use in young non-oral children. *Exceptional Parent, 14*(4), 19-24.**

The author describes how she used computer technology as an aid to intervention with young children who have language difficulties. The approach features appropriate language goals, play contexts, and the use of synthesized output.

**Meyers, L. F. (1986). Teaching language. *Exceptional Parent, 16*(7), 20-23.**

The article provides details on three classroom projects using computers and synthesized speech software to foster expressive language and facilitate language comprehension in severely visually disabled preschoolers and preschool and school-age Downs syndrome children. Using a computer with a child with cerebral palsy for story comprehension and spontaneous communication is also described.

**O'Connor, L., & Schery, T. K. (1986). A comparison of microcomputer-aided and traditional language therapy for developing communication skills in nonoral toddlers. *Journal of Speech and Hearing Disorders, 51*(4), 356-361.**

This study compares the vocabulary learning/use and social and communication growth of eight severely disabled nonoral toddlers (six with Downs syndrome) under two conditions: (1) a microcomputer-based approach; and (2) traditional language intervention techniques. Results indicated no differential effect for either treatment condition.

**Osguthorpe, R. T., & Chang, L. L. (1987). Computerized symbol processors for individuals with severe communication disabilities. *Journal of Special Education Technology, 8*(3), 43-54.**

The study evaluates the feasibility of using two commonly available peripheral devices (Apple Graphics Tablet and Power Pad) and specially developed software to help 12 individuals with moderate and severe disabilities use written communication (Rebus symbols). Students learned the symbol processing system and used it effectively for personal communication.

**Osguthorpe, R. T., & Chang, L. L. (1988). The effects of computerized symbol processor instruction on the communication skills of nonspeaking students. *Augmentative and Alternative Communication, 4*, 23-24.**

The purpose of this study was to measure changes in receptive and expressive language skills of nonspeaking students by teaching them to use a newly developed computerized symbol processor system. The results of the study indicate that students with severe communication impairments can be taught in a relatively short period of time to express themselves independently in writing. Further, students who were taught to use the symbol processor system did significantly better on measures of language comprehension and symbol recognition than the control group which received no instruction.

## Access and General Use Characteristics

**Battenberg, J. K., & Merbler, J. B. (1989). Touch screen versus keyboard: A comparison of task performance of young children. *Journal of Special Education Technology, X*(1), 24-28.**

This study compares the effects of the type of computer input device on the task performance of 40 developmentally delayed and 40 nondelayed kindergarten children. Results indicate that a touch-sensitive screen enhances performance through reducing preoccupation with the response device.

**Crusco, A. H., Carter, P., McGrath, M., Payne, E., Antonow, J., & O'Dell, S. (1986). Skill requirements for interactive video instruction of persons with mental retardation. *Mental Retardation, 24*(2), 99-105.**

This study looks at the extent to which persons with moderate cognitive abilities possess the skills necessary for using an interactive video system, without individual teacher training. Observers measured each student's ability to perform two basic learning tasks—to sit through the sessions and to attend to the screen. The results strongly suggest that with no pretraining, interactive video cannot be assumed to be useful with this population.

**Fazio, B. B., & Rieth, H. J. (1986). Characteristics of preschool handicapped children's microcomputer use during free-choice periods. *Journal of the Division for Early Childhood, 10*(3), 247-54.**

The exploratory study examines computer use during free time in two classrooms for mildly and moderately impaired 3- to 5-year-olds. Results indicate that computer use was a frequent activity choice, children used the computer for a relatively long time, they preferred software with excellent graphics, and they rarely chose "drill and practice" software.

**Freidman, S. G., & Hofmeister, A. M. (1984). Matching technology to content and learners: A case study. *Exceptional Children, 51(2),* 130-134.**

A microcomputer/videodisc-based instructional system (MCVD) that does not require extensive teacher involvement was developed to provide individualized instruction to disabled learners. The results of the field testing and the implications of the program are addressed. The overall approach de-emphasizes direct comparison of teachers to machines and emphasizes the simultaneous use of teachers and technology to increase educationally productive time for disabled students in individualized classrooms.

**Hofmeister, A. & Others. (1986). Videodisc technology: Providing instructional alternatives. *Journal of Special Education Technology,* 7(3), 35-41.**

Five different levels of instructional videodisc and microcomputer configurations are described and discussed in relation to the needs and resources of the special education program. The authors suggest that principles of effective instruction should be applied to the development and utilization of videodisc technology.

**Powers, D. A. (1986). Evaluating software for use by mentally handicapped learners. *Computers in the Schools, 3*(3-4), 41-49.**

This discussion of the use of microcomputers by mentally disabled learners focuses on software availability and selection. Criteria for evaluating software are given, including considerations of visual display, reading level, program design, drill-and-practice opportunities, positive reinforcement, format variety, graphics, instructional feedback, and supplementary materials.

## Daily Living Skills/Self-Help

**Browning, P., White, W. A. T., Nave, G., & Barkin, P.Z. (1986). Interactive video in the classroom: A field study. *Education and Training of the Mentally Retarded, 21*(2), 85-92.**

The effectiveness of interactive video in teaching the skill of asking for help was evaluated. An eight-lesson interactive video sequence was presented to 116 secondary-aged mildly and moderately impaired students. Comparison of pre- and post-tests of both knowledge and application showed positive effects.

**Browning, P., & White, W.A.T. (1986, December). Teaching life enhancement skills with interactive video-based curricula. *Education and Training of the Mentally Retarded*, pp. 236-244.**

The Project LIVE curriculum series intends to facilitate the transition for disabled learners from school to community. Distinctive curricular features include: (a) focus on life enhancement skills as content-domains; (b) utilization of multiple teaching strategies as the crux of the instructional design; and (c) simulation of life-events through interactive video technology.

**Holz, Else. (1979). *Computer assisted instruction for teaching basic money handling skills to mentally handicapped students at Christine Meikle School in Calgary*. Edmonton, Canada: Alberta Department of Education, Planning and Research Branch. (ERIC Document No. ED 212 101)**

The study investigates the effectiveness of computer-assisted instruction (CAI) in teaching the necessary arithmetic skills for handling small amounts of money. Results show that while learning took place for both the study (CAI) and control groups, the difference is statistically significant for the study group.

**Thorkildsen, R., Fodor-Davis, J., & Morgan, D. (1989). Evaluation of a videodisc-based social skills training program. *Journal of Special Education Technology, X*(2), 86-98.**

This study was designed to determine the effectiveness of a videodisc based social skills training program for mildly disabled elementary school children. The program teaches children how to use appropriate phrasing, intonation, and body language in such social interactions as getting involved and being positive. The videodisc is used to present examples of appropriate and inappropriate social behaviors, and models to imitate in subsequent role-playing activities. Results of the study indicate that both videodisc instruction and peer tutoring were important to the success of the program. Videodisc

program design considerations are also discussed. The program described is currently under development for conversion to a level one videodisc application, which will be available October, 1991.

**Wissick, C. A., & Kinzie, M. B. (1989). The development and design of a videodisc simulation for training grocery shopping skills to students with moderate or severe handicaps. In R. Fox (Ed.), *Proceedings from the Eleventh Annual Society for Applied Learning Technology Conference on Interactive Videodisc in Education and Training*, (pp. 28-31). Warrenton, VA: Society of Applied Learning Technology.**

The introduction of new technologies such as the microcomputer and videodisc offer possibilities for increasing the effectiveness of special education training programs. The creation of simulations, such as this training for grocery shopping, can model the experience of the natural environment and avoid the practical problems associated with training students in the community.